

REMARKS

Favorable reconsideration, reexamination, and allowance of the present patent application are respectfully requested in view of the foregoing amendments and the following remarks.

Claim 12 has been slightly amended to grammatically correct the claim.

Rejections under 35 U.S.C. §§ 102, 103

In the Office Action, beginning at page 2, Claims 1-4, 6, 8, 10, 12, 13, 17, and 23 were rejected under 35 U.S.C. § 102, as reciting subject matters that allegedly are anticipated by U.S. Patent No. 6,007,326, issued to Ryan II, *et al.* (“Ryan”). Additionally, beginning at page 4, the remaining claims were rejected under 35 U.S.C. § 103(a), as reciting subject matters that allegedly are obvious, and therefore allegedly unpatentable, over the prior art. More specifically, Claims 5, 7, 9, 14-16, 20-22, 24-26, and 28 were rejected under section 103(a) over *Ryan* in view of the disclosure of U.S. Patent No. 5,888,272, issued to Prasad *et al.* (“Prasad”), and Claims 11, 17-19, and 27 were rejected under section 103(a) over U.S. Patent No. 5,636,977, issued to Benson *et al.* (“Benson”) in view of the disclosures of Japanese patent document no. 57-47119 and *Prasad*.

Applicant respectfully requests reconsideration of these rejections.

As described throughout this application, one aspect of the present invention includes satisfactorily functional possibilities for the combustion of weakly reactive and nitrogen-free gas mixtures. In particular, exemplary embodiments of the present invention provide an improved process and an installation operating with the combustion of nitrogen-free gas mixtures, using a flameless combustion for the combustion of a nitrogen-free gas mixture.

The claimed combinations lead to a synergistic effect, since a combustion process operating with flameless combustion is particularly suitable for the combustion of weakly reactive gas mixtures. Where a weakly reactive gas mixture is to be burnt, in particular where the oxygen of the gas mixture to be burnt, with the mixture obtained by, e.g., means of an oxygen transport membrane with rather large scavenging gas quantity, the output capability of the combustion process operating nitrogen-free can be distinctly improved by the combination,

according to the invention, of a combustion process operating nitrogen-free with a flameless operating combustion process. The synergistic effect is not expected, because prior combustion processes operating with flameless combustion have been used expressly for the reduction of NOX formation or NOX emissions. These, however, do not exist at all in the case of a combustion process operating nitrogen-free. To this extent, the present invention uses the combustion process operating with flameless combustion for a different purpose, because the use of flameless combustion in a combustion process operating nitrogen-free permits reliable and stable combustion of a weakly reactive gas mixture.

Thus, one aspect of the invention includes the use of flameless combustion (known for reducing NOX formation) in a combustion process operating without nitrogen, *i.e.*, a process in which the reduction of NOX formation is nonsensical. The synergy available by the present invention, that the combustion of weakly reactive nitrogen-free gas mixture can be stabilized, cannot be expected by the person of ordinary skills in the art.

Claim 1 relates to a combustion process having a combination of steps, including: forming a substantially nitrogen-free gas mixture from oxidant, fuel, and inert gas; and combusting said gas mixture in a burner, wherein combusting comprises flameless combustion.

Claim 12 relates to an installation useful for carrying out a combustion process having a combination of features, including: a mixture forming device configured and arranged for the formation of a substantially nitrogen-free gas mixture of oxidant, fuel, and inert gas, and a burner configured and arranged for carrying out flameless combustion, the mixture forming device configured and arranged to bring oxygen and fuel together in the burner first to form a gas mixture having a temperature above the self-ignition temperature of said gas mixture.

The prior art, including *Ryan*, fails to identically disclose or describe, or fairly suggest, processes as recited in the combinations of the pending claims.

All of the subject matter described in the prior art documents referring to flameless combustion is completely oriented at the reduction of the formation of NOX. More specifically, *Ryan* repeatedly emphasizes that his goal is NOX reduction:

Abstract, first sentence: "A low NOX combustion process is carried out..."

Column 3, lines 37 and 38: “The invention discloses a combustion process aimed at decreasing NOX formation.”

Column 5, lines 21 and 22: “. . . appears to favor a reduction in NOX generation”

Accordingly, *Ryan* fails to identically disclose or describe combinations of steps or elements as recited in the combinations of Claims 1 and 12, at least because *Ryan* only describes the reduction of NOX, and therefore plainly uses a gas mixture that has very significant levels of nitrogen.

Benson is similarly oriented to the use of a gas mixture that includes significant concentrations of nitrogen; for example, see *Benson*’s Abstract, first line, which indicates that the subject matter of the disclosure is “A burner apparatus and method for reducing NOX...”.

Prasad describes a combustion process using a substantial nitrogen-free gas mixture. This known process operates with a conventional combustor (see reference sign 14 in fig. 1) performing a combustion process with a flame. This is disclosed at least indirectly, since the combustor is operated close to stoichiometric or slightly fuel-rich condition (see column 8, lines 53 to 56). Nowhere does *Prasad* disclose, describe, or suggest flameless combustion.

While a combination of features from *Prasad* with those of *Ryan* and/or *Benson* might lead to subject matter similar to that recited in the combinations of the pending claims, a full and fair reading of the prior art instead reveals that there is no motivation to make the combinations alleged in the Office Action to be obvious.

As discussed above, *Ryan* and *Benson* use flameless combustion always for reducing the formation of NOX. This methodology makes sense only when the oxidant of the combustion process includes considerable amounts of NOX or NO₂. Usually, air is used as the oxidant (see, e.g., *Benson*, Fig 1, left side). Air contains 78% of N₂. Also, *Ryan*’s gas mixture to be burnt contains considerable amounts of NOX or NO₂; see column 4, line 31. Accordingly, the statement of the Office Action, page 3, line 8, is plainly not correct; *Ryan* uses nitrogen-containing gas mixtures. There is no suggestion whatsoever in *Ryan* to use nitrogen-free gas mixtures.

The ordinarily skilled artisan knows that in the prior art, flameless combustion is used to

reduce the formation of NOX. The skilled artisan also recognizes that the formation of NOX cannot be reduced in a combustion process using a nitrogen-free gas mixture. If there is no nitrogen, the formation of NOX cannot be reduced, since there is no formation of NOX to begin with. Accordingly, the person of ordinary skill in the art would not look to combine *Prasad* with *Ryan* or *Benson* in order to improve the nitrogen-free combustion process of *Prasad*, or the NOX-reducing processes of *Ryan* or *Benson*, for to do so would not make any sense: flameless combustion is always mentioned with respect to the reduction of NOX formation, which is plainly not a concern when a nitrogen-free gas is used. The use of a process operating with flameless combustion and recognized for the reduction of NOX formation would, therefore, in the mind of the person of ordinary skill in the art, not be combined with a nitrogen-free combustion process, which fundamentally operates without NOX emissions, because the combustion process operating nitrogen-free cannot be improved with respect to its NOX emissions.

For at least the foregoing reasons, Applicant respectfully submits that the subject matters of Claims 1-4, 6, 8, 10, 12, 13, 17, and 23 are not anticipated by *Ryan*, are therefore not unpatentable under 35 U.S.C. § 102, and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 102. Furthermore, Applicant respectfully submits that the subject matters of Claims 5, 7, 9, 11, 14-22, and 24-28, each taken as a whole, would not have been obvious to one of ordinary skill in the art at the time of Applicant's invention, are therefore not unpatentable under 35 U.S.C. § 103(a), and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 103(a).

Conclusion

Applicant respectfully submits that the present patent application is in condition for allowance. An early indication of the allowability of this patent application is therefore respectfully solicited.

If Mr. Price believes that a telephone conference with the undersigned would expedite passage of this patent application to issue, he is invited to call on the number below.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. If, however, additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and the Commissioner is hereby authorized to charge fees necessitated by this paper, and to credit all refunds and overpayments, to our Deposit Account 50-2821.

Respectfully submitted,

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